PHILADELPHIA UNIVERSITY
DEPARTMENT OF BASIC SCIENCES

Final Exam A **DISCRETE STRUCTURES** **04–02–2014**

PART (I) Each problem is worth 2 points. Circle one answer.

1) Evaluate LCM (493, 323).

   a) 7429 b) 8303 c) 8381 d) 9367

2) How many permutations with { A, B, C, D, E, F } do not contain "ACE" ?

   a) 24 b) 120 c) 696 d) 714

3) Let A = {2, 5, 6, 7, 9} and the equivalence relation R = {(a,b) | a mod 2 = b mod 2}. Find the equivalence classes.

   a) {2, 6}, {5, 7, 9} b) {2, 7, 9}, {5, 6}
   c) {2, 4, 8}, {5, 7} d) {2, 7, 8}, {4, 5}

4) Let R = {(1,3), (2,1), (3,2), (4,2)}. Then R^3 =

   a) {(1,2), (2,3), (3,1), (4,1)} b) {(1,1), (2,2), (3,3), (4,3)}
   c) {(1,4), (2,3), (3,1), (4,3)} d) {(1,1), (2,4), (3,3), (4,4)}

5) How many integers from 1 to 1000 are multiples of 4 and not of 6 ?

   a) 63 b) 84 c) 126 d) 167

6) Which graph has 12 edges?

   a) P_6 b) C_6 c) K_6 d) K_2,6

7) Which graph has the largest diameter?

   a) C_9 b) K_9 c) P_9 d) K_9,9

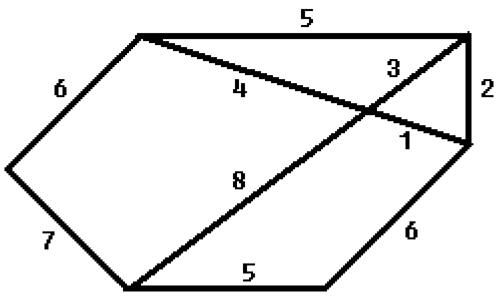
8) Which graph has an Euler circuit?

   a) K_6 b) K_9 c) K_2,9 d) K_1,6

9) Convert the incidence matrix $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 1 & 0 \\ 1 & 1 & 0 & 1 \\ 0 & 0 & 1 & 1 \end{bmatrix}$ to adjacency matrix.

a) $\begin{bmatrix} 0 & 0 & 1 & 0 \\ 0 & 0 & 1 & 1 \\ 1 & 1 & 0 & 1 \\ 0 & 1 & 1 & 0 \end{bmatrix}$ b) $\begin{bmatrix} 0 & 0 & 1 & 1 \\ 0 & 0 & 1 & 1 \\ 1 & 1 & 0 & 0 \\ 1 & 1 & 0 & 0 \end{bmatrix}$ c) $\begin{bmatrix} 0 & 1 & 1 & 0 \\ 1 & 0 & 1 & 1 \\ 1 & 1 & 0 & 0 \\ 0 & 1 & 0 & 0 \end{bmatrix}$ d) $\begin{bmatrix} 0 & 1 & 1 & 0 \\ 1 & 0 & 0 & 1 \\ 1 & 0 & 0 & 1 \\ 0 & 1 & 1 & 0 \end{bmatrix}$

10) Find the weight of the minimal spanning tree (MST) for the given graph.



a) 21 b) 23 c) 24 d) 28

PART (II) Each problem is worth 5 points. Write complete solutions.

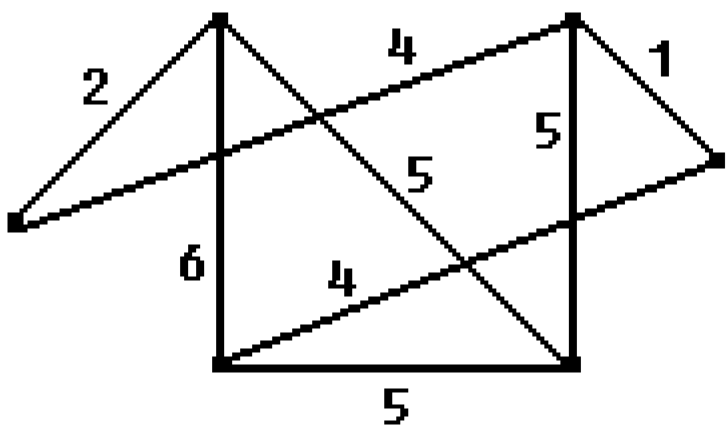
11) Convert the proposition $(P \leftrightarrow Q) \rightarrow R$ to CNF.

12) Use induction to prove $2^n < n!$ for all integer $n \geq 4$.

13) Let A = { 2, 3, 6, 9, 18 } and R = { (a,b) | b mod a = 0 }.

a) Draw the graph of R.
b) Prove that R is a partial order relation.
c) Draw the Hasse diagram for R.

14) Solve the Chinese postman problem (CPP) for the given graph.



--Amin Witno